Introduction to Machine Learning and Deep Learning

Part 2

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ZB MED – Information Centre for Life Science & TH Köln

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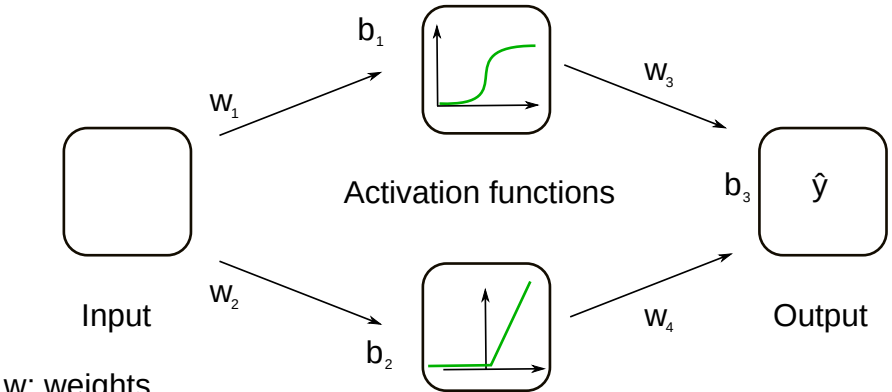
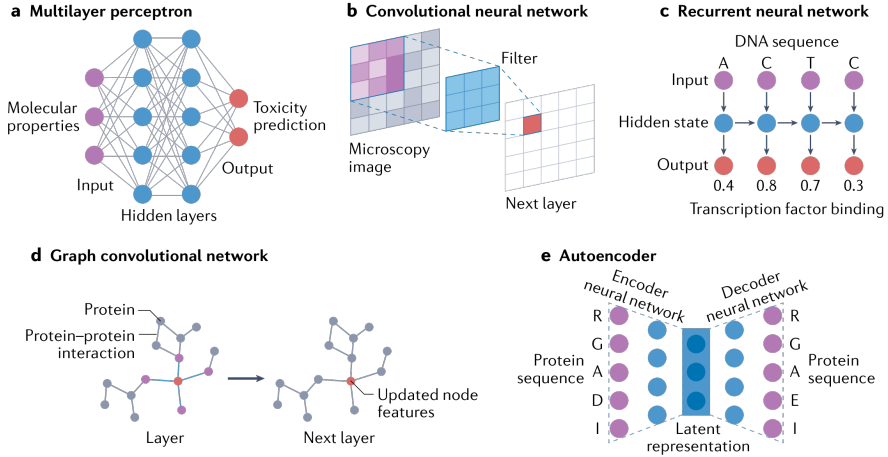
1. Deep Learning Overview
2. Multilayer perceptrons / Feed-forward neural networks
3. Convolutional Neural Networks (CNN)
4. Recurrent neural network (RNN) and Long short-term memory (LSTM)

Deep Learning Overview

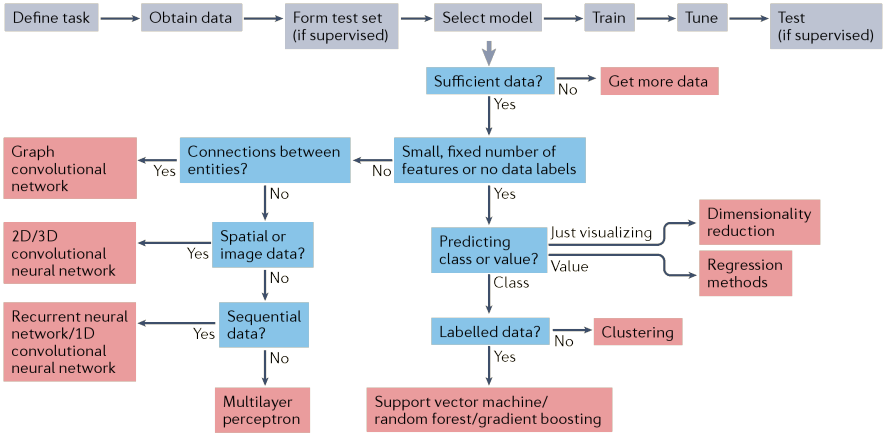


Deep Learning Overview



(Greener et al., 2022, https://doi.org/10.1038/s41580-021-00407-0

Deep Learning Overview



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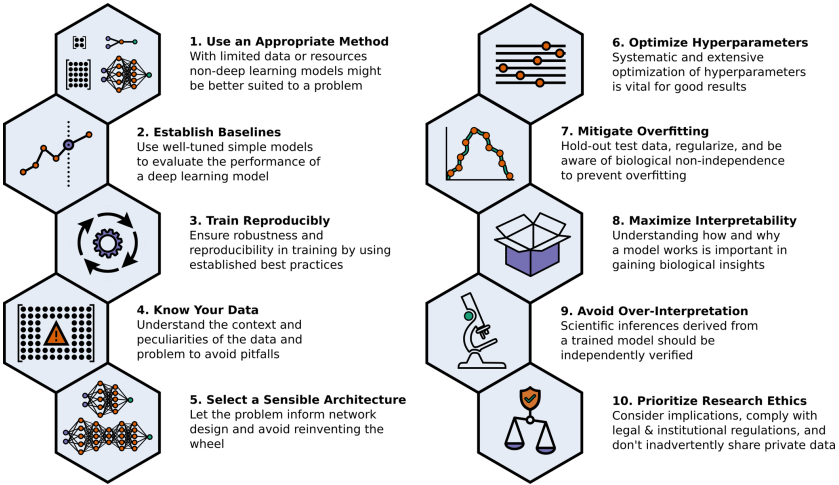
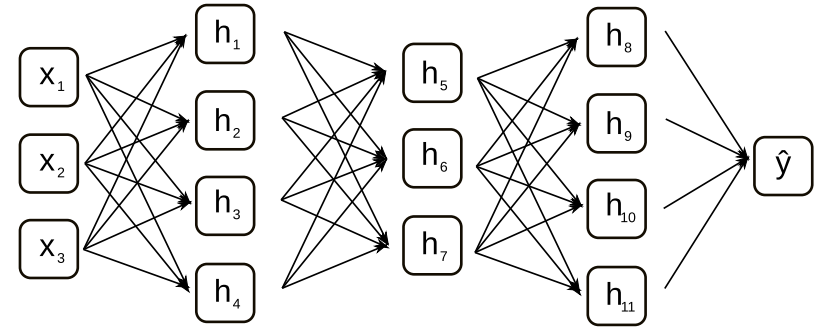
Deep Learning Overview

Ten Quick Tips for Deep Learning in Biology



(Lee et al., 2022, https://doi.org/10.1371/journal.pcbi.1009803

Multilayer perceptrons



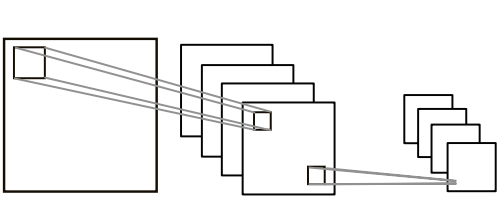
Multilayer perceptrons

- fixed number of input nodes/features

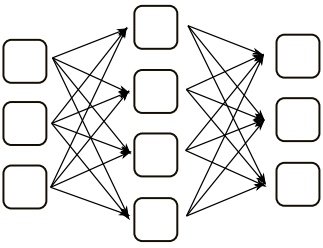
Convolutional Neural Networks (CNN)

- useful for image processing and pattern recognition tasks
- sparse network

Convolutional Neural Networks (CNN)



Input layer Convolutional layers Pooling layers



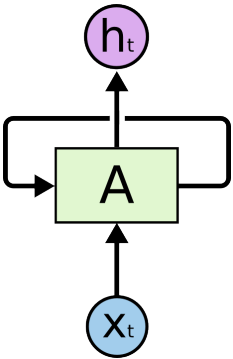
Dense layer Output layer

Feature Selection Flattening Classification

Recurrent neural network (RNN)

- for sequential data of any length
- Widely used in Natural Language Processing (NLP) and time series
- Have feedback loops
- Long-Term dependency problem

Recurrent neural network (RNN)



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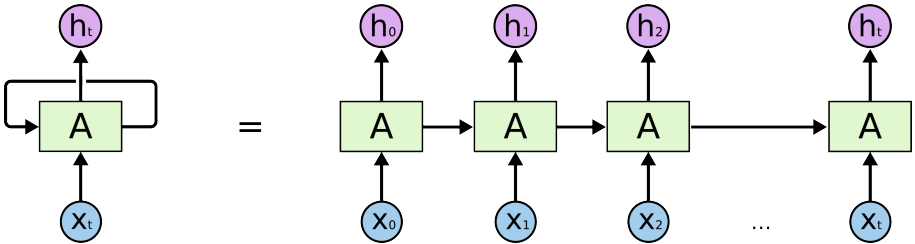

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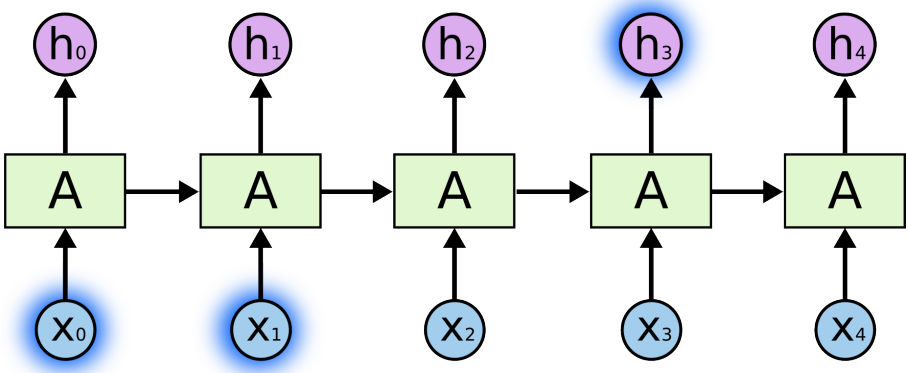
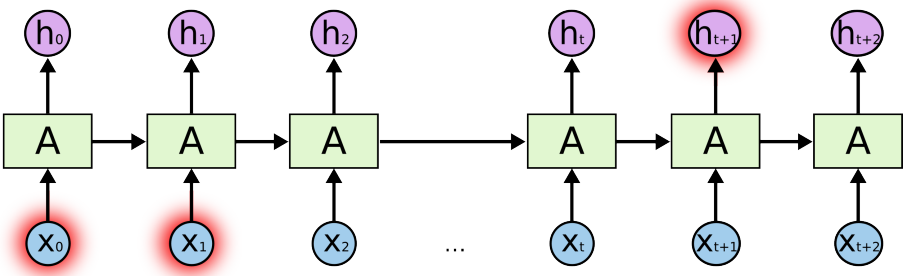


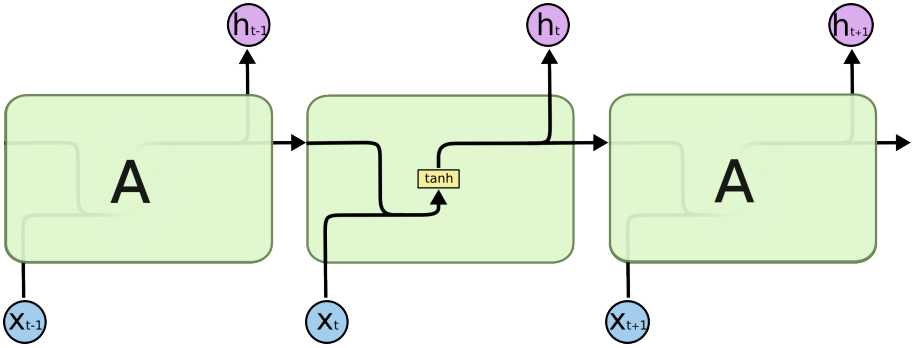
Recurrent neural network (RNN)



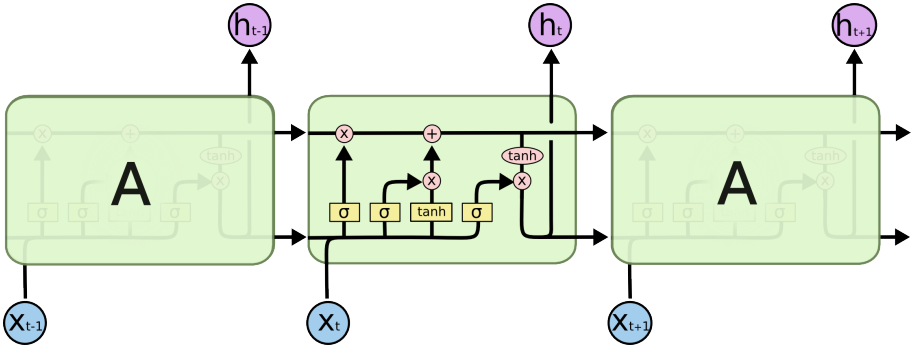
Long short-term memory (LSTM)

- Solve the Long-Term dependency problem of RNNs

Long short-term memory (LSTM)



Long short-term memory (LSTM)



Thank you for your attention

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